National Institute of Environmental Health Sciences

Investigating the climatic impact of urban planning strategies through the use of regional climate modelling: A case study for Melbourne, Australia

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Abstract:

Urban planning is a useful method for improving local climate and human health in cities through purposefully modifying urban land surface characteristics. This can reduce the potential risks of elevated city temperatures due to the urban heat island (UHI). Unfortunately, simple tools are not readily available for urban planners to assess the climatological impacts of various urban development scenarios. Urban modelling could be developed into such a tool to achieve this. This study attempts to design and evaluate a suitable tool for application in Melbourne, Australia. The Air Pollution Model (TAPM) was chosen to assess the impact of a long-term urban planning strategy on local climate and the above canopy UHI in Melbourne. Improvements were made to TAPM by increasing the number of urban land-use classes in the model and creating a higher resolution land cover database focused on housing density. This modified version of TAPM showed a good performance in replicating the surface energy balance compared with an observational flux tower site in suburban Melbourne during summer. TAPM simulated a mean maximum UHI intensity of 3-4 °C at 2 a.m. in January. A future UHI scenario was then examined (year 2030) using an urban land cover database derived from plans in the Melbourne 2030 urban planning strategy. Results highlighted specific areas where planning intervention would be particularly useful to improve local climates, namely activity centres and growth areas. The appropriateness of the use of TAPM and climate models as a tool in urban planning is also discussed.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Temperature

Temperature: Extreme Heat, Fluctuations

Geographic Feature:

resource focuses on specific type of geography

Urban

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Australasia

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type: ☑

format or standard characteristic of resource

Research Article, Research Article

Resilience: ☑

capacity of an individual, community, or institution to dynamically and effectively respond or adapt to shifting climate impact circumstances while continuing to function

A focus of content

Timescale: ☑

time period studied

Medium-Term (10-50 years)

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content